

## CLAIMS

1. A method for segmenting a 2D gel image by associating initial protein seed candidates with surrounding regions **characterised by** comprising the following
- 5 steps:
- defining at least one interface circumscribing an initial seed in its immediate surrounding,
  - defining a velocity function  $F(x, y)$  for said interface,
  - bringing said interface to evolve in accordance with  $F(x, y)$ ,
  - 10 - defining at least one stopping criterion  $C$  and stopping the evolution of said interface in accordance with said criterion,
  - associating the area inside said stopped interface with said initial seed.
2. The method according to claim 1 **characterised by**
- 15 - calculating the time of arrival,  $T_a(x, y)$  for said evolving interface in pixels surrounding said initial seed
- defining said stopping criterion  $C$  so that  $C$  depends on  $T_a(x, y)$  in the pixel representing the latest circumscribed pixel by said evolving interface and/or functions thereof.
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3. The method according to claim 2 **characterised by**
- that said stopping criterion  $C$  depends on the gradient  $T_a'$  of  $T_a(x, y)$  in the pixel representing the latest circumscribed pixel by said evolving interface and/or functions thereof.
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4. The method according to claim 1 **characterised by** defining said stopping criterion  $C$  so that  $C$  depends on  $F(x, y)$  and/or functions thereof.
5. The method according to any of above claims **characterised in** that the evolution
- 30 of said interface is carried out by
- defining and calculating a time of arrival,  $T_a(x, y)$ , for a set of trial candidate pixels,
  - identifying the trial candidate pixel  $P_{Tmin}$  with the smallest  $T_a$ , and
  - letting the interface evolve to said trial candidate pixel  $P_{Tmin}$ .
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6. The method according to claim 5 **characterised by**
- rejecting a trial candidate pixel as a candidate pixel if it is established that said candidate trial pixel constitutes a pixel representing a known pixel associated with an evolving interface originating from another initial seed.

7. The method according to any of above claims 1-4 **characterised in** that the evolution of said interface is carried out by
- an iterative calculation of  $T_a(x, y)$  for a set of candidate pixels,
  - 5 - defining and calculating a departure time,  $T_d$ , for said candidate pixels,
  - identifying the candidate pixel  $P_{Td}$  with the smallest  $T_d$ ,
  - letting the interface propagate to said pixel points,  $P_{Td}$ , outside or inside neighbours depending on the sign of the speed function  $F$  in said point  $P_{Td}$ .
- 10 8. The method according to claim 7 **characterised by**
- rejecting a trial candidate pixel as a candidate pixel if it is established that said trial candidate pixel constitutes a pixel representing a known pixel associated with an evolving interface and that the value of the speed function  $F(x, y)$  in said trial candidate pixel is positive.
- 15 9. The method according to any of above claims **characterised by** the following steps:
- defining a first function  $F_1(x, y)$ ,
  - defining at least a second function  $F_2(x, y)$  differing from  $F_1(x, y)$ ,
  - 20 - defining a criterion  $C2$  for at least an amount of pixels inside a region of said image,
- wherein said criterion  $C2$  defines whether  $F_1(x, y)$  or  $F_2(x, y)$  is valid for said amount of pixels.
- 25 10. The method according to claim 9 **characterised in** that said criterion  $C2$  is a criterion for identifying saturated regions.
11. The method according to claim 1 **characterised in** that  $F(x, y)$  depends on the intensity function  $I(x, y)$  for said image and/or functions thereof.
- 30 12. The method according to any of above claims **characterised in** that  $F(x, y)$  depends on the distance to said initial seed and/or functions thereof.
13. The method according to any of above claims **characterised in** that  $F(x, y)$
- 35 depends on the curvature of said evolving interface and/or functions thereof.
14. The method according to any of above claims **characterised in** that  $F(x, y)$  depends on the normal direction of said evolving interface and/or functions thereof.

15. The method according to any of above claims **characterised in** that  $F(x, y)$  depends on the curvature of the intensity function  $I(x, y)$  and/or functions thereof.
16. The method according to any of above claims **characterised in** that  $F(x, y)$  depends on the gradient  $G(x, y)$  of the intensity function  $I(x, y)$  for said image and/or functions thereof.
17. The method according to any of above claims **characterised in** that  $F(x, y)$  depends on the shape of said evolving interface and/or functions thereof.
18. The method according to any of above claims **characterised in** that  $F(x, y)$  depends on the angle between the intensity gradient,  $\bar{G}$ , of  $I(x, y)$ , and a vector  $\bar{V}$  representing the instantaneous distance to  $(x, y)$ .
19. A computer program element to be used for the segmentation of a 2D gel image by associating initial protein seed candidates with surrounding regions, said program element **characterised in** that it comprises computer program code means making a computer execute the steps defined by any of above claims 1-18:
20. A computer readable medium **characterised in that** it comprises computer program code means according to claim 19.
21. A system for processing 2D gel images comprising a computer **characterised in that** said computer has access to the program element according to claim 19.